

Shows -

- 1) definite form of execution for types of movements.
- 2) form adapted to joint structure
 - 2) position of muscles.
 - 3) least expenditure of force.

Form -

- 1) economy of energy.
- 2) attainment of movement.
- 3) buoyancy & elasticity.

Muscular activity.

- must know metabolic process.
- 1) respiration + heart action increased.
- 2) metabolism + nutrition affected.

Fatigue.

- 1) breathlessness.
- 2) use of effort + pressure under muscular contractions.

Heart.

- Strengthened by exercise.
- beats faster - rate increases.
- waste products act as hormones, nerves + brain stimulated + heart beats faster.
- blood vessels dilate + contract. (arteries)

Athlete's heart.

- arteries thicken.

Chap. 3.

The Effect of Bodily energies on Bones & Joints.

Framework moves through muscle pull.
Muscles - motor organs. | affected by
Bones - passive organs. | exercise

Bones - growth from ends.

length - calcium deposits under cartilage
of joint. (increases 3 times)

thickness - periosteum. (rickets)

Growth - stimulated by pressure - effects
of joints of short duration.

- increase blood supply at bone ends.
- increase nutritional substances
& salts

Bone growth - by muscle pull.

(tuberosities, ridges, edges.)

- periosteum - ~~formation~~ ^{thickness} of bone wall.

Bone structure

- Form bony ring.

- tiny osseous fibres support ring
(give resistance & lightness.)

Bone deformity. (pulling or pressure)

Kyphosis - posterior thoracic curve.

Lordosis - lumbar curve.

Scoliosis - lateral curve.

Curvatures -

- change shape of spine & surfaces of
vertebrae.

- due to 1) faulty posture

2) one-sided burdening of spinal
column

- Associated with 1) lowered body vitality.
2) power of resistance.
- Exercise should 1) develop upright posture.
2) stimulate growth of bones & ligaments of spine
3) strengthen weak back muscles.

Posture.

1. Fatigue
2. Occupation
3. Mental outlook.
4. Malnutrition.

Nucleus is life of muscle.

- control nervous reactions.
- every fibre of muscle is stimulated.

Tendon - elongation of muscle.

- made of connective tissue - non-elastic.
- pt. attach. of muscle to bone.

Long muscle - motion

Short " - strength & support.

Long thin - protection & support.

Built for function.

Muscles of shoulder-joint - rot. ad. & ab.

hand - grasping

abdomen -

back -

Breathing - by muscle action.
Inter - costals -
- contract + pull ribs up.

Artic. Pressure

Muscular contraction.
- nervous stimulus - relaxation.

Muscle twitch
- whole contraction of muscle.

Empathic responses.
- imitation of another person.

Muscle curve.
- latent period
contraction
relaxation

Muscle fiber -
CO₂ in muscles - stiffness

Absolute muscle strength.
scientific muscle strength.

Muscle - contraction
glycogen + O₂ + stimulus →

Heat - CO₂ + lactic acid + H₂O.

Lactic acid - $\frac{4}{5}$ - back to glycogen.
 $\frac{1}{5}$ - expelled rest through
lungs, skin, bladder.

Muscle tone.
Readiness to contract.
Lacks look of exercise
disease.

Removal of blood.
Blood returns from muscle to the
muscles + heart.

Chap. 4.

Effect of Bodily Exercise on Bone Muscle Groups.

Voluntary muscles - to body, not

- during exercise receive blood.
- arteries + capillaries enlarge to muscles + lungs.
- called skeletal muscles.
- contracted + stretched by will.

Structure.

- striated.
- small bundles of muscle fibres.
- ✓ - nuclei - elongated.
 - contain elements of growth + reproduction + repair.
 - enlarge muscle fibres.

2nd - Sarco - plasma - albuminous.

3rd - muscle fibres.

4th - sarcolemma.

- contain blood vessels + nerves.
- blends with bone periosteum.

Tendons.

- strong muscle fibres - tissue.
- long + short.

Muscles

- long, band-like, spindle-like.

Granities.

- shifted as feet ~~move~~ ^{change} direction.

Mt. transference in walking.

- heel, outer border of foot, toe.
- runners land on sole of foot.
- (heel retards speed.)

Shock absorbers of body.

- angular position of neck of femur.
- fibres of knee joint.
- intervertebral discs.

Supporting - hand on toes, hand ankle, knee, hip joint + spine.

Balance of trunk - muscles of thighs, hips, flanks, erector spinae.

86% - muscles of pelvis + thigh. (legs)

28% - muscles of trunk, arm + hand.

327 muscles - int. + muscle mass.

quadriceps femoris.

gluteus med.

gastrocnemius

adductor magnus

iliopsoas

gluteus med.

sacrospinalis

deltoid, triceps +

biceps brachii.

pect. major.

Act of Breathe.

Deep inspiration, fin shoulder blades.

- close the glottis + fin throat.

- fin abdominal + intercostal muscles.

- press back to moving muscles.

Posture.

- straight carriage.

- normal curves of spine - balanced body.

- head high + straight.

- chest free + arched.

- shoulders not drooping.

Round shoulders.

- occupational.

- tight pectorals.

Abdominals.

- firmness elasticity to abdominal wall.

- muscles of respiration.

- draw throat down.

- draw throat down to pelvis.

- bend trunk forward.

- help rotate trunk.

- exert pressure on alimentary canal.

Respiration - exchange of gases in lungs.
internal respiration - gaseous exchange of insides.

external r. - gaseous exchange of lungs.

Medulla oblongata - tests blood & regulates O_2 + CO_2 balance by nervous system.

CO_2 acts as a hormone.

Heart beats faster - action of CO_2 acts as a chemical hormone in medulla.

Dilation of heart - stored blood in veins rushes into heart + expands it.

Metabolism - breaking down + building up body.
- controlled by:

1) thyroxine.

2) exercise + food.

3) weather.

carb. - starches & sugars - glucose - glycogen.

protein - amino acids.

Work - ~~not~~ x int. x distance.

Metabolism - can be trained.

- body learns to utilize food better.

Work - mountain climbing, bicycling, endurance.

reptile - *A. sternalis* does not produce maximum contraction.

● Chapter 5.

The Physiological Processes in Muscular Work and the Influence of Exercises upon them.

Exercise.

Voluntary muscles contract.

- made up of small fibres.
- afferent nerve - contract
- sarcoplasm - fibrils.
- covered with sarcolemma.
- in bundles - membrane contains vessels & nerves.
- covered with fascia.
- composition - protein, fat, salts, water. (75-77%)
- combination H_2O + protein - colloid combination.

Sensitiveness + contractibility.

- small changes in cell - salt sol. presence.
- nerves stimulate change.
- cause shortening of fibres \therefore whole muscle.
- only enough fibres contract.

Muscle twitch.

- muscle contraction - amt. of mechanical work performed.
- contraction curve - state is moved past touching line.
- time of contraction is not simultaneous with received stimulus.

Latent period.

- muscle prepares for contraction after stimulation.
- increased by fatigue + amt. increase.

Tetanic contraction.

- continued contraction & nerve stimulation.

Fatigue.

- latent periods becomes longer
- maximum of contraction occurs later.
- work of muscles slower, curve lower.
- no muscular energy "muscular fatigue".

Tension.

- int. to great for muscle.

Isometric tension.

- (sustained work)

- shortening of stimulated muscle prevented.
- no work done.

Isotonic.

- muscle in action maintains same tension during work.

Most contractions - mixture of both.

Tired work muscles.

- higher in sarcoplasm - low in fibrils.
- slower twitching - economizes energy.

Rest tone.

- tension & contraction kept up by a reflex developed through its own lengthening.
- sensory nerves tell brain of lengthening.

Metabolism.

- carbohydrate in cell - changes.
- amt. of glycogen reduced - lactic acid H_2

Lactic acid.

- produces contraction - by acting chemically on fibrils.

1) - $\frac{1}{5}$ with O_2 changes to - $H_2O + CO_2$
 $\frac{4}{5}$ changes glycogen.

2)

(heat from body)

(formed by formation of $H_2O + CO_2$).

- 3) transformation by help of phosphoric acid.
glycogen + P acid - lacticidogen.
- which produces energy.
- excreted by urine.

Fatigue collects when O_2 cut off.

- process caused by nerve stimulus.
- running caused most lactic acid prod.
- greatest collection of lactic acid 8-9 minutes after exertion.

Glycogen decomposed by.

- 1) lactic acid
- 2) CO_2 - formed by lactic acid + O_2 .

Respiration

- CO_2 inhalation, greater than O_2 intake.
- respiratory muscles fatigued.

Muscle Fatigue.

- lactic acid + lack of O_2 weakens muscle.
- muscle must build new lacticidogen to function on.
- protein split produces fatigue poisoning in large muscle groups.
- kidneys influence in fatigue.
 - eliminate protein r. + w. corpuscles, casts & wastes.

Part to making muscle.

- increases no. of contractions.
- sends out more blood - each contraction.
- arteries enlarged - nerve stimulation.
- capillaries enlarge.
 - through self-acting cellular elements.
 - by influence of protein in blood.



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